THE EVOLUTION OF E-INCLUSION

Technology in Education for the Vision Impaired

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Abstract: The 1970s and 1980s saw a rapid take-up in the use of personal computers. During the same time period, society began to move towards providing equity for people with disabilities. As legislators around the world created new disability and Information Technology policies, more people with disabilities were given access to education and the evolving computing tools provided unprecedented educational opportunities. These opportunities were due to the use of new technologies such as outputting of electronic text to voice synthesizers. The provision of assistive technology was not only helpful; it also provided education through a medium that was previously unavailable, particular to the blind and vision impaired. For much of the 1980s the development of text-processing sensory technologies, connected to personal computers, led to a closer equality between the educational services of the able-bodied and people with disabilities.

Unfortunately this evolution as not without notable difficulties: issues surrounding the cost of products, the lack of support from large corporations and choice of platform resulted in substantial difficulties for educators in the assessment of appropriate technology. In addition, many of these products became largely redundant in the late-1980s as corporations began to place more emphasis on the Graphical User Interface (GUI). Although the GUI was remarkably successful in allowing the general public to gain better access to personal computing, it's non-text nature once again caused a digital divide for people with disabilities. Although it is clear that the evolution of the personal computer has had a significant impact on the provision of education for people with disabilities, this paper highlights the historical repetition where innovation is prioritized above e-inclusion.

Key words: Vision Impairment; Education; Disability; Computing history; E-inclusion; Digital divide

1. INTRODUCTION

The History of Computing in relation to education contains a vast array of achievements. Few would argue that the framework established in the development of personal computing in the 1970s and 1980s essentially changed the way we interact as a global community.

Although it is important to reward such profound and revolutionary achievements, it is easy to forget that during this time period there are interesting developmental parallels in relation to human rights and social justice. In regards to people with disabilities, the evolution of technology is not just an achievement, but also an opportunity to gain unprecedented access to products and services unlike any other time in history. This e-inclusive evolution also, in turn, provided the tools necessary to move beyond individual education and establish the education of our society in the importance of equity in all areas of daily life.

In relation to people with disabilities, the benefits of the new electronic medium were clear: as approximately 80% of our traditional education structure is presented in a visual format, students with vision impairment were unable to access information that is common to other students until the personal computer provided the opportunity to translate text into other mediums, such as voice. (Levtzion-Korach et al, 2000, Ross, et al, 2001)

Yet despite the promise of unprecedented educational opportunities, the rapid change in technological growth often left people with disabilities in the wake of innovation. As a result, people with disabilities were given a taste of substantially empowering technology, only to be denied those opportunities in the ever-growing desire to move forward. Although computing achievements are often seen as a double-edged sword for people with disabilities, the evolution of e-inclusion has provided unprecedented support to the creation of education of the individual and education of our society.

2. THE ADVENT OF PERSONAL COMPUTING

The dawn of mainstream computing in the mid- to late-1970s provided an opportunity for society to increase their productivity and entertainment needs within the home and the workplace. The speed of growth and the battle for supremacy between computer offerings from companies such as Commodore, Apple, Radio Shack and Atari led one commentator to reflect on this time as "...one of the most remarkable phenomena of recent history." (Davies, 1984, p. i) As people discovered the benefits of home computing, Western governments were presented with a difficult challenge in creating

legislation to meet the emerging legal issues that had appeared as a result of such technology.

2.1 Equity and Technology

During the same time period, another rapid change was taking place in our society: the evolution of equity and social justice. Until the mid-1970s, the rights of people with disabilities were very limited. In order to raise awareness and provide some legislative framework for government policy, the World Health Organisation (WHO) released official definitions for the terms disability, impairment, and handicap. It also show-cased some of the prototype accessible technology during the International Year of Disabled Persons. (Richards, 1982) One of the more significant items on display at this time was the SYNTE2, one of the first microprocessor-based and portable speech synthesizers in the world.

The establishment of official definitions of disability led to the development of disability policy through the early to mid-1980s. The development of these policies led to a refinement of disability terminology and an increased societal acceptance of people with disabilities as equals. One of the most significant changes in disability policy resulted in increased access to education. Countries such as the United States, England and Australia had notable increases of disabled students in tertiary institutions in the late-1970s and through the 1980s due directly to various public laws in the US and equivalent policies, such as the Disability Services Act of 1986 in Australia (Clear, 2000) Not only were enrollments increasing but the proportion of people with disabilities who completed tertiary education in the same time period increased as well.

3. ASSISTIVE TECHNOLOGY

Although the framework of disability legislation is certainly a major factor for the improvements in education for people with disabilities during the late-1970s and 1980s, the parallel development of computing technology also played a significant role in providing additional educational opportunities for people with disabilities. One of the biggest benefits of having data in electronic format was the ability to easily output data in an accessible format. Many of the early assistive technologies focused on assisting people who were blind or had vision impairment via such popular speech synthesizers based on the Votrax speech synthesis chip. Examples of these synthesizers included the Brother Caiku, Eke, Humanica and Task. (Lemmetty, 2004) Over the course of the 1980s, other products were made

to assist people with different types of disunities through the use of light pens for people with mobility impairments, and on-screen alerts for people with hearing impairments.

Although the increased individual opportunities were indeed beneficial, the development process of technology for people with disabilities was not progressing as rapidly as the growth of the Information Technology industry: With the exception of IBM, few mainstream computing firms seemed to take issues of accessibility seriously, and it became apparent in the mid-1980s that in order for education to benefit from the computing revolution, it would require a major shift in public education practices to truly highlight the needs of people with disabilities in the development of Information Technology. (Lansdown, 1980)

As a result, most of the development of assistive technology was undertaken by specialist companies that unfortunately resulted in assistive technology becoming expensive and often out of the price range of those that needed it. This left both educators and legislators with dilemmas regarding which equipment provided the best platform for the development of assistive technology. Little attention was given to the incorporation of emerging technology for people with disabilities by legislators; this was due in part to the difficulties in meeting the legislative needs of mainstream technology and in part because of the difficulty in providing broad guidelines that could encompass all the competing 8-bit and 16-bit computing platforms in the market. The fear in disability circles was that this lack of action would result in severe computer inequity, leading one of the more disadvantaged sections of our society to become alienated from a world that was becoming increasingly technologically dependent. (Gergen, 1986)

In relation to the specific struggle of people with disabilities in education, there were additional difficulties in both affording and providing assistive technologies. With no mandate from government policy, it was left to the educational institutions to determine the best technological needs for their students. The benefits of assistive technology were rapidly becoming apparent, but the small client base made it difficult to justify the costs involved. The choice of platform also had to be determined:

For example, the Epson HX-20 was determined by many Australian educators to be a vital tool for developers in the early to mid-1980s for blind and vision impaired people. The reason for this selection was due to it's portability, built-in screen, and relative affordability at approximately $4,000AU$. However, software speech synthesis could be better handled by popular 8-bit machines such as the Commodore 64 and, in the mid- to late-1980s, the Commodore Amiga range of computers. Furthermore computers such as these also had support for light pen technology that would assist people with mobility issues. Furthermore, machines such as the Apple II

were cheaper and already had a significantly larger user base that the Epson HX-20. (Gergen, 1986)

Figure 1. The Epson HX-20 microcomputer

4. EDUCATIONAL NEED

As the general public became more informed about the needs of people with disabilities, the wave of social change led to educators creating methods of assessment to provide accessible technology to people with disabilities in order to assist their educational needs. This was not just limited to the educational institution: it quickly became apparent that having a personal computer in the home would greatly assist in performing related tasks and the teaching of life skills. One such action plan determined that the most important elements of developments were based on the issues of the type of technology best suited to the user, the quality of technology, in what context would the technology be used, and what were it's primary strengths and weaknesses. These criteria, established in the 1980s, are still relevant today. (Bryant & Bryant, 2003)

Sometimes, however, the best intentions can often result in increased complexity within the selection process. Many educators have adopted Semelfort's guidelines (as cited in Bryant & Bryant), based again on the assessment process in the 1980s. Those guides include the need to assemble a technology evaluation team including teachers, students and appropriate professionals, the consideration of input from the user, the focus on the

functionality of the selected technology, the need for simplicity and benefits of the product. Although these guidelines may appear to be a sensible and thoughtful approach to the provision of accessible technology, the time required to select a number of professions, make the assessments and gain a full understanding of the user requires a significant amount of time and often resulted in students with a disability floundering behind fellow classmates due to these unfortunate delays. (Dorman, 1998)

5. STANDARDISATION OF PERSONAL COMPUTING

Fortunately the progression of the mid- to late-1980s revealed many benefits for people with disabilities. As the existing technology became more established, the price of assistive technology came down. The development of assistive technology became centralized to the IBM PC platform due to it's increasingly popularity with business and educational institutions that embraced this platform to ensure educational training resulting in a knowledge of IT products in the workforce. The other advantage of the IBM PC was that the material was all text-based, assistive technologies such as speech synthesizers had been refined to a point where they could easily interpret the information. (Lemmetty, 2004)

At the close of the 1980s people with disabilities were getting unprecedented access to information. The legislators were also starting to focus more on disability policy, with the United States in particular working on the strengthening of its disability laws. Although the evolution of technology was still seemed to be a little volatile for specific IT-based legislation for people with disabilities, the ongoing public education of the needs of people with disabilities gained significant strength during this time. (Bricout, 2001)

Although text-based computing was now in prominence, the end of the 1980s revealed a computing spectre that was gaining in popularity, the Graphical User Interface (GUI). Gaining significant popularity from the commercial success of the Apple Macintosh released in 1984 (Sanford, 2004), numerous platforms began to focus on GUI implementation. 16-bit systems such as the Commodore Amiga and the Atari ST were developed as GUI operating platforms. Even older 8-bit platforms such as the Commodore 64 received a GUI overhaul from programs such as GEOS being built into the sale of 8-bit machines. The fading CP/M operating system and the popular MS-DOS operating system were now making way for new developed by Microsoft and IBM on the IBM PC platform. (Necasek, 2004)

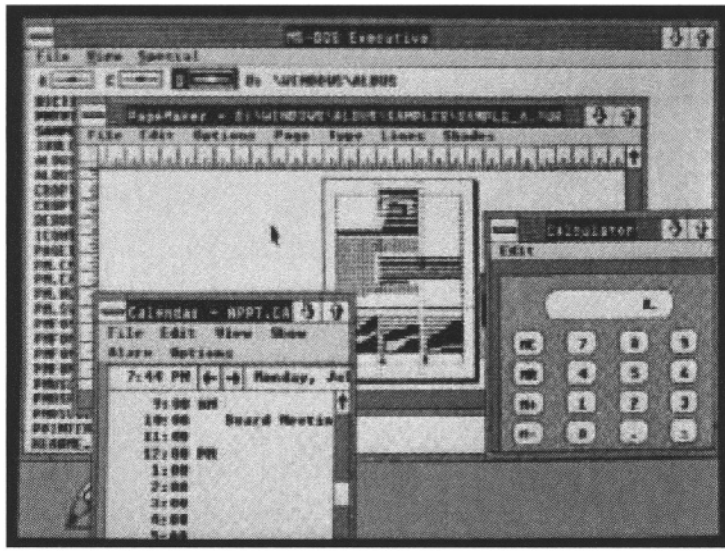

Figure 2. Microsoft Windows 2.0

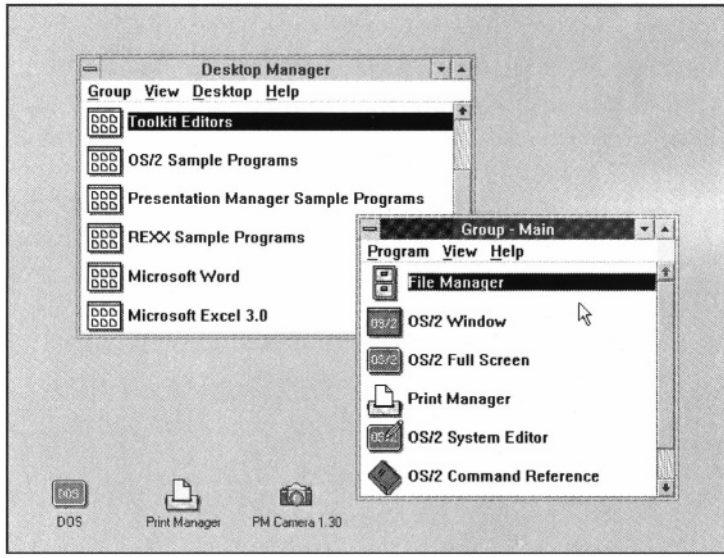

Figure 3. IBMs OS/2 version 1.1

The twilight of the 1980s saw two GUI products gaining popularity for the PC platform: Microsoft Windows 2.0 and IBM's OS/2 1.1. Although both products still had text-based DOS functionality, software developers were embracing the GUI interfaces. (Lessard, 2004) Although IBM endeavored to provide accessibility features in OS/2 with a degree of success, most of the large corporations did not implemented accessibility features into the new interface which rendered which left much of the assistive technology useless. (Necasek, 2004) In the rush of competition and innovation, people with disabilities were once again faced with the likelihood of trying to catch up to the able-bodied population in an attempt to embrace technological equality.

6. CONCLUSION

When reflecting back on the evolution of e-inclusive technology, it is easy to forget that "each and every one of us knows moments of inability." (Shearer, 1981, p. 2) Although access to technology for people with disabilities has improved considerably since it's initial chaotic inception, the pattern of innovation, division, and e-inclusion is a constantly repeating one: from the dawn of home computing through the introduction of the GUI and more recently the Internet, we are constantly reminded that the needs of people with disabilities are constantly sidestepped in the rush to embrace new technology.

As a society, it is imperative we continue to create policy and provide a corporate framework to support those which rely so heavily on technology not just to achieve everyday tasks, but to provide access to information and opportunities which would simply not be possible if it were not for the availably of IT products and services. In particular, there is a need to support people with disabilities in their educational endeavors and ensure that the provision of tools is adequate and prompt in delivery.

Perhaps the issue of most significance when reflecting on the history of people with disabilities in relation to education is that of public education. The ongoing effort to enlighten our society to the equality and needs of people with disabilities clearly provided an unprecedented opportunity through the parallel evolution of computing and led to opportunities never seen previously. As we will all have moments of disability in our lives, to help people with disabilities will in turn assist all those in the community. Through individual and public education, the evolution of e-inclusion will continue to flourish and provide equal computing products and services to all.

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